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ZUM KONTINENT DES EISIGEN SÜDENS.

VON

ERICH VON DRYGALSKI.

The importance of Antarctic exploration was first brought to Dr. von Drygalski's notice in 1883-84 by Freiherr von Richthofen. It was not until the later '90s, however, that the project of a German expedition was developed, largely through the efforts of Dr. Moritz Lindeman, Dr. L. Friederichsen, Professor G. von Neumayer, Karl Koldewey, Rear-Admiral Count von Baudissin, Dr. F. Schmidt, Minister Count von Posadowsky-Wehner, Dr. Th. Lewald, Professor Supan, and some others.

The keel of the *Gauss* was laid at the Howaldt works in Kiel in May, 1900, and she was practically finished in May, 1901. She was a three-masted schooner, with square sails on her foremast, and an auxiliary screw, and she was built principally of oak, teak, pine, and greenheart. She was 46 meters long, 10.70 meters broad, and had a speed of about seven knots.

The chief members of the expedition were Dr. Erich von Drygalski, Dr. Ernst Vanhöffen, zoologist and botanist; Dr. Emil Philippi, geologist and chemist; Dr. Friedrich Bidlingmaier, meteorologist; Dr. Hans Gazert, surgeon; Captain Hans Ruser, First Officer W. Lerche, Second Officers R. Vahsel and L. Ott, and Chief Engineer Albert Stehr.

It was decided to have a station for meteorologic and magnetic observations on Kerguelen Island in conjunction with the Antarctic expedition. Dr. Karl Luyken, Dr. Werth, and Dr. Joseph Enzensperger were chosen for this work, and went out on the S.S. *Tanglin*, taking with them the dogs for the *Gauss*. Dr. Enzensperger, unfortunately, died of beri-beri on Kerguelen Island on the 2d of February, 1903.

The *Gauss* started from Kiel Harbour on August 11th, 1901, and sailed *via* Madeira and the Cape Verde Islands to Cape Town, which was reached only on November 23d. The reason for this long passage was that much deep-sea fishing and many soundings and temperature measurements were done in the South Atlantic. The *Gauss* left Cape Town on December 7th, and proceeded, mostly under sail and sometimes under steam, to the Crozet Islands, which were reached on December 25th. These were found to be entirely

volcanic, and many sea-elephants were seen there. Thence the *Gauss* laid her course to Kerguelen Island, where she anchored in Royal Sound on January 2d, 1902. The auxiliary expedition of German scientists was met there, and the dogs were taken aboard.

The *Gauss* did not leave Kerguelen Island until January 31st. She reached Heard Island, which seems to be principally, if not entirely, volcanic, on February 3d. After a short stay, the *Gauss* sailed southeast, and began to meet icebergs in about 56° S. lat. on the 10th of February. In about 58° S. lat., soundings were taken which, for the first time, brought up stones of continental origin. The *Gauss* continued pushing south, with icebergs and pack-ice constantly on the increase. On the 14th of February she was on the edge of thick pack, and not being able to continue south, began to take a westerly course. At this point the *Gauss* was some distance north and west of Wilkes' extreme western point, near Termination Land. Four explorers—Cook, Wilkes, Nares, and Drygalski—have been round this spot,* and found the ice too solid to be penetrated, an almost certain proof that not far back there must be a supporting nucleus of solid land—"Termination Land"—under the ice. The *Gauss* now steamed west and southwest along the edge of the pack until on the 18th of February she was in 90° E. long. There the pack grew thinner, and she was able to make her way south and a little east, and on the 21st of February high land was seen northwest from the *Gauss*. This was in a direct line with the spot whence Wilkes saw "the appearances of land," which he charted as "Termination Land," and there can be no reasonable doubt that Dr. von Drygalski there saw the west coast of Termination Land.†

Later the same day, the *Gauss* reached a hitherto unsighted part of the coast of East Antarctica, west and a little south of Termination Land. This new land was christened "Kaiser Wilhelm II. Land." Its position is just south of the Antarctic Circle, between about 90° and 92° 30' E. long. The edge was an ice wall 40 or 50 meters high, which sloped gently back to a height of some

* *Antarctica*, by Edwin Swift Balch, Philadelphia, 1902, pages 70, 156, 195.

† In his first paper about his expedition in the *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, 1904, No. 1, Dr. von Drygalski spoke positively of the non-existence of Termination Land. The writer called attention to this as being an error in the *National Geographic Magazine*, May, 1904, Vol. XV, p. 220-221, and argued that "Termination Land" and Dr. von Drygalski's "Hohes Land" must be identical. Dr. H. Wichmann shortly afterwards acknowledged, in *Petermanns Mitteilungen*, the accuracy of this criticism. In a note in *Zum Kontinent des Eisigen Südens*, page 233, Dr. von Drygalski gives it as his opinion only that his "Hohes Land" can scarcely be identical with Termination Land; but he adds that he did not give any name to the "Hohes Land" and that the name "Kaiser Wilhelm II. Land" only applies to the coast-line on both sides of the Gaussberg.

300 meters, beyond which nothing could be seen. A fearful storm with heavy snow now came on, and the *Gauss* was tossed hither and thither in considerable danger among the ice, until the morning of the 22d, when she came to a stop just beyond 66° S. lat., in about 89° 45' E. long. Here she was frozen in and remained until the 8th of February, 1903.

Winter soon came on, and the usual routine of a polar wintering was gone through, except, perhaps, that an unusual amount of scientific observations was made. Magnetic, astronomical, and meteorological stations were set up on the ice, and observations were taken regularly. A balloon was rigged up and numerous captive ascents were made, the first in Antarctica. A height of 500 meters was attained, and on one occasion the temperature at that altitude was high enough for Dr. von Drygalski to work without gloves. Zoological specimens were secured, among them several varieties of fish—*Notothenia*, *Lycodes*, and *Gymnodraco*. *Lycodes* is also found in the Greenland seas, and is another example that there is some similarity between the two polar faunas. Ice, icebergs, and ice temperatures were studied by Dr. von Drygalski himself, and he observed and took photographs of many forms and varieties of ice. None of these seems ever to have been of the prismatic kind which was especially studied by the Rev. G. F. Browne, and which the writer himself has often seen underground in *glacières*.^{*} Much reading was done during the winter, and Dr. von Drygalski speaks highly of the works of Ross, Wilkes, and D'Urville, and he recognizes how easily mistakes could be made in the "forties" in regard to distinguishing land-ice and sea-ice, since even to-day, with all the accumulated knowledge on the subject, it is not always easy to do so.

Beginning with the middle of March, numerous sledge parties were sent out. On one of these, on the 22d of April, a small mountain was discovered to the southwest of the ship. It was christened the Gaussberg, and was ascended several times during the course of the year. It was largely free from snow, and appears to be volcanic in formation. Nests of several species of sea-birds were found in the hollows of the lava.

The expedition came to the same conclusions about clothing that most others have—namely, that furs were only useful to sit down or to sleep in, and that woollen garments with an outside canvas wind-breaker were far better suited for active work. The usual lack of flavour was noticeable in the preserved foods; and it was observed that it was well to have preserves come from as many

^{*} *Glacières or Freezing Caverns*, by Edwin Swift Balch, Philadelphia, 1900.

different firms as possible, as it was noticed, for instance, that the same kind of soup tablets from two different firms had a more distinctive flavour than two different kinds of soups from the same firm. This led to the curious result, probably unique in the annals of cookery, that the *menus* were made up by mentioning the names of the firms instead of the contents of the tins. Seals and penguins, of course, were largely the basis of the diet. Quantities of sugar were craved by the men. Dr. von Drygalski himself considered six lumps in a large cup of tea the right number, and Dr. Bidlingmaier thought ten lumps made each cup of tea or coffee hardly sweet enough. The importance of sugar in a polar diet has never been so forcibly noticed before.

Towards January, 1903, fearing the ice might not break up, Dr. von Drygalski began to prepare to meet a relief vessel by retreating to Knox Land. He says "a voyage to this from the winter quarters of the *Gauss* would have to take place along the vicinity of the coast," which shows that Dr. von Drygalski thinks the coast stretches from Kaiser Wilhelm II. Land to Knox Land, or, in other words, that he really believes in the existence of Termination Land.

In January and February, 1903, the ice near the *Gauss* was cut with saws and blown up with explosives; yet little was accomplished. But in the beginning of February the ice began to break up of itself, and on the 8th of February the *Gauss* was able to work her way back towards the ocean, or, rather, was floated along with the slowly-moving pack. The course was nearly due west until the 25th of February, when the *Gauss* was in 86° E. long. There she was able to work her way northward, and on the 16th of March she reached the open sea. Here a westerly direction was taken to about 80° E. long, where an attempt was made to push south along the course where the *Challenger* crossed the Antarctic Circle, but heavy pack prevented the *Gauss* from reaching the 66th parallel. In the beginning of April the *Gauss* once more steered back to the open sea, sailed past Kerguelen Island, and in the end of April stopped at St. Paul Island and New Amsterdam Island. Thence she returned *via* Natal, Cape Town, and the Atlantic Ocean to Germany, reaching the mouth of the Elbe on the 24th of November, 1903.

It seems a pity that so much time was spent on the down voyage in the Atlantic. Had the *Gauss* reached the coast of Termination Land in the beginning of January instead of the middle of February, it is possible that much more exploring might have been done before she was frozen in, and the outline of East Antarctica as far as Kemp Land might perhaps have been roughly sketched in. With this

exception the expedition was well handled, and it has made some important additions to our knowledge of the Antarctic. Dr. von Drygalski's book is well and conscientiously written, but it errs, perhaps, in being too long, and it sadly needs an index.

The Belgians, the English, the French, the Germans, the Scotch, and the Swedes have now recently sent out Antarctic expeditions, with great benefit to science. These efforts appear to have stopped. Yet much remains to be done. Would it not be possible for America to take the matter up in turn? It almost seems as if it were a national duty to send a steamer like the *Bear* to repeat at least the voyage of Wilkes from Cape Hudson to Termination Land, and to try to chart more definitely the coasts of which he could, in his old sailing vessels, at the best only get glimpses.

EDWIN SWIFT BALCH.

UNITED STATES GEOLOGICAL SURVEY PUBLICATIONS.

PROFESSIONAL PAPERS. No. 29. Forest Conditions in the Absaraka Division of the Yellowstone Forest Reserve, Montana, by John B. Leiberg. Contains the usual description of forest conditions, with land classification and map. In view of the sharp differences of opinion now expressed about glacial erosion, it is of some interest to find the author speaking of the Pleistocene glacier as sculpturing and fashioning the region into its present forms, cutting gorges thousands of feet deep. More than 30,000 acres in the Reservation are occupied by lakes of glacial origin, lying either in rock basins or behind masses of moraine.

No. 30. This also belongs to the Forestry series, is by the same author, and describes the Little Belt Mountains Forest Reserve and the Little Belt Mountains quadrangle, shows composition of the forest, gives distribution by regions and altitudes, and gives township descriptions.

No. 31. Preliminary Report on the Geology of the Arbuckle and Wichita Mountains in Indian Territory and Oklahoma, by Joseph A. Taff. Reported ore deposits of the Wichita Mountains are discussed by H. Foster Bain, the investigation leading to negative results and no encouragement to further prospecting.

BULLETINS. No. 234. Geographic Tables and Formulas, compiled by Samuel S. Gannett. Brings together matter needed in field and office by members of the Topographic Corps.

No. 236. The Porcupine Placer District, Alaska, by Charles W. Wright. This region is in southeastern Alaska, and its develop-